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Applicant: Timothy Roy Block et al.

Art Unit: 2155

Serial No.: 09/694,586

Examiner: Benjamin R. Bruckart

Filed: October 23, 2000

Atty. Docket No.: IBM/167

For: DYNAMIC MODIFICATION OF CLUSTER COMMUNICATION
PARAMETERS IN CLUSTERED COMPUTER SYSTEMRESPONSE

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Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

This paper is submitted in reply to the Office Action dated February 3, 2004, within the three-month period for response. Reconsideration and allowance of all pending claims are respectfully requested.

In the subject Office Action, claims 1-31 were rejected under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent No. 6,108,699 to Mojin. Applicants respectfully traverse the Examiner's rejections to the extent that they are maintained.

Turning first to the rejection of independent claim 1, this claim generally recites a method of dynamically modifying a cluster communication parameter in a clustered computer system. In addition, the various steps in the claimed method involve the modification of a cluster communication parameter.

As discussed, for example, at pages 4 and 5 of the Application, cluster communication parameters are typically low-level communication parameters that control how each node operates in a clustered computer system. Put another way, these communication parameters typically define the protocol that a node uses to communicate

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with other nodes and/or the format of the messages being communicated between such nodes.

An important aspect of such communication parameters is that it is often problematic in conventional systems to change those parameters based upon the fact that the parameters are used to control how nodes interact with one another, and are thus used continuously in an active system. Given also that clustered systems are usually used in high availability applications, and thus should not be taken off line for any appreciable amount of time, Applicants identified an acute need for providing an orderly change of a communication parameter used by multiple nodes in an active clustered computer system with minimal system downtime, if any.

Various examples of cluster communication parameters are set forth at page 12, line 30 to page 13, line 11, of the Application, including, for example, "heartbeat parameters used to confirm the liveliness of interconnections between nodes in a cluster, e.g., heartbeat message time out, heartbeat acknowledgment message time out, heartbeat frequency or interval, heartbeat failure threshold, heartbeat acknowledgment failure threshold, receive/send timer ratio, etc." In addition, several other types of communication parameters are identified, including, for example, "maximum fragment sizes, message retry timer value, maximum message retry time, send queue overflow threshold, message send window size, etc."

Moiin, on the other hand, does not disclose the dynamic modification of any clustering-related parameter that can be analogized to a "cluster communication parameter" consistent with the invention. Instead, it appears that Moiin discloses the management of membership of nodes in a cluster, without any specific disclosure directed to the particular messaging protocols utilized to manage node membership.

Moiin does disclose, at col. 2, the concept of a "reconfigure message"; however, such a message is quite clearly used to add or remove nodes to or from the cluster. In connection with the processing of such messages, parameters are interchanged including a

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cluster size N and a cluster list or vector V, with the former parameter simply storing the number of nodes identified in node list V. (col. 5, lines 32-46).

Of note, however, neither the cluster size, nor the cluster list or vector, corresponds to a "cluster communication parameter" within the context of claim 1. Both disclosed parameters in Moiin relate to cluster membership; however, neither relates to how communications occur between nodes. Indeed, the remainder of Moiin is entirely silent with respect to the particular protocols used to communicate between nodes, other than the fact that the nodes are interconnected by a conventional ethernet network. (col. 5, lines 14-18).

Given that neither a cluster size nor a cluster list corresponds to a "cluster communication parameter", Applicants respectfully submit that Moiin cannot be read to anticipate claim 1. Withdrawal of the Examiner's §102(a) rejection of claim 1 is therefore respectfully requested.

In addition, Applicants respectfully submit that claim 1 is non-obvious over Moiin, in that Moiin does not appreciate any of the problems associated with modifying cluster communication parameters in an active clustered computer system. Moiin expects the messaging operations occurring between nodes to occur in an orderly manner, but there is absolutely no disclosure in the reference directed to how one could change any messaging operations through dynamic modifications to communication parameters that control how those messaging operations are performed. Accordingly, Applicants submit that one of ordinary skill in the art would not look to Moiin and derive from the disclosure of the reference of a method of dynamically modifying a cluster communication parameter.

Indeed, cluster membership is a completely different concept from cluster communication protocols, presenting entirely different problems requiring substantially different solutions. Among other unique problems, dynamic modifications to cluster communication parameters must be cognizant of the fact that active communications are

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continually being performed in an active clustering environment, and that the change-over to a new cluster communication parameter must be handled in an orderly fashion and with minimal interruption in messaging traffic. In contrast, changes in cluster membership are rather infrequent events, as even admitted at col. 8, lines 2-5 of Moiin, so the concern with interruptions in messaging capability are simply not present for changes to membership-related parameters.

Applicants therefore respectfully submit that claim 1 is also non-obvious over Moiin. Reconsideration and allowance of claim 1, as well as of claims 2-6 which depend therefrom, are respectfully requested.

Next, with respect to claim 2, this claim depends from claim 1, and specifies that the cluster communication parameter comprises a heartbeat parameter. In rejecting claim 2, the relies on col. 14, lines 26-34 of Moiin. However, this passage merely describes the use of heartbeat messages. There is no disclosure in the reference of making any changes to any parameter associated with such heartbeat messages. Indeed, given that the dynamic changes being made in the various routines disclosed in Moiin are all directed to changes in membership, Applicants respectfully submit that these routines do not disclose or suggest any dynamic modifications to a heartbeat parameter. Reconsideration and allowance of claim 2 for this additional reason are therefore respectfully requested.

Next, with respect to claim 3, this claim depends from claim 1, and specifies that the cluster communication parameter is selected from a group consisting of:

heartbeat message time out, heartbeat acknowledgment
message time out, heartbeat frequency or interval, heartbeat
failure threshold, heartbeat acknowledgment failure
threshold, receive/send timer ratio, maximum fragment
size, message retry timer value, maximum message retry
time, send queue overflow threshold, message send window
size, and combinations thereof

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As noted above in connection with claim 2, Moiin's disclosure of heartbeat messages falls far short of disclosing the dynamic modification of heartbeat or other communication-related parameters. Each enumerated item recited in claim 3 is an example of a communication-related parameter, and the disclosure of membership modifications in Moiin is insufficient to anticipate the concept of dynamically modifying any of these enumerated items. Reconsideration and allowance of claim 3 for this additional reason are therefore respectfully requested.

Next, with respect to independent claims 7, 12 and 13, each of these claims likewise recites the dynamic modification of a cluster communication parameter. As discussed above in connection with claim 1, Moiin merely discloses, at the most, changes to membership-related parameters such as cluster size and a cluster list. Nothing in Moiin discloses or suggests the dynamic modification of a parameter used in cluster communications. Accordingly, claims 7, 12 and 13 are all novel and non-obvious over Moiin for the same reasons as claim 1. Reconsideration and allowance of these claims, as well as of claims 8-11 and 14- 18 which depend therefrom, are respectfully requested.

Next with respect to independent claim 19, this claim generally recites a method of dynamically modifying a heartbeat parameter in a node among a plurality of nodes in a clustered computer system. In addition, among other features, claim 19 specifically recites the concept of sending a heartbeat message from a first node to a second node, where the heartbeat message indicates that a heartbeat parameter is to be modified, as well as the concept that modification of the heartbeat parameter in the first node is deferred until receipt of an acknowledgment message from the second node that indicates that the heartbeat parameter has been modified in the second node.

In rejecting claim 19, the Examiner relies on Moiin, and in particular, the disclosure at col. 14, lines 26-34 which discuss the sending of heartbeat messages. However, as discussed above in connection with claim 2, Moiin does not disclose dynamically modifying a heartbeat parameter. Furthermore, the cited passage of Moiin

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does not disclose the content of a heartbeat message or an acknowledgment thereto, and specifically fails to disclose that a heartbeat message may include an indication that a heartbeat parameter is to be modified, or that an acknowledgment message may include an indication that a heartbeat parameter has been modified.

In view of these shortcomings, Moiin cannot be read to anticipate claim 19, so the §102(a) rejection thereof should be withdrawn. Furthermore, claim 19 is non-obvious over Moiin in that there is no suggestion to modify Moiin to change heartbeat parameters using the membership management routines disclosed in the reference. Communications are discussed only by way of background, as are heartbeat messages or "keep alive" concepts. As noted at page 3, line 28 to page 4, line 3, of the Application, changing a heartbeat parameter can be problematic in an active clustering environment. These unique problems, however, are not appreciated by Moiin, and as such, the reference fails to render claim 19 obvious. Reconsideration and allowance of claim 19, as well as of claims 20-25 which depend therefrom, are therefore respectfully requested.

Next turning to independent claims 26 and 31, each of these claims likewise recites the dynamic modification of a heartbeat parameter through the use of heartbeat messages that indicate that a heartbeat parameter is to be modified and acknowledgment messages that indicate that a heartbeat parameter has been modified. As discussed above in connection with claim 19, these features are not disclosed or suggested by Moiin, and as such, each of these claims are novel and non-obvious over the reference. Reconsideration and allowance of claims 26 and 31, as well as of claims 27-30 which depend therefrom, are therefore respectfully requested.

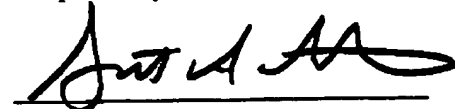
In summary, Applicants respectfully submit that all pending claims are novel and non-obvious over the prior art of record. Reconsideration and allowance of all pending claims are therefore respectfully requested. If the Examiner has any questions regarding the foregoing, or which might otherwise further this case onto allowance, the Examiner may contact the undersigned at (513) 241-2324. Moreover, if any other charges or credits

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are necessary to complete this communication, please apply them to Deposit Account 23-3000.

3 MAY 2004
Date

Respectfully submitted,



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